IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/696,671
Applicant	:	Ivarie et al
Filed	:	October 28, 2003
Title	:	Transgenic Avians That Lay Eggs Containing Exogenous Proteins (amended)
TC/A.U.	:	1633
Examiner	:	Kaushal, Sumesh
Docket No.	:	AVI-000CON

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O Box 1450, Alexandria VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on or before:

Date August 13, 2007
Signature
Name Kyle Yesland

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF DR. ROBERT D. IVARIE PURSUANT TO 37 CFR 1.132 (IVARIE DECLARATION)

Sir:

I, Dr. Robert D. Ivarie, hereby declare as follows:

1. I currently hold the position of Professor and Head of Genetics, University of Georgia. My professional experience and educational background are detailed in my attached curriculum vitae (IVARIE CURRICULUM VITAE).

2. As a co-inventor, I have personal knowledge of the invention disclosed and claimed in the above-referenced patent application (hereinafter the "Application").

3. I understand that the Patent Examiner in the subject case has rejected certain claims based on the premise that making germ-line transgenic avians which produce exogenous protein in the oviduct is unpredictable and not routine and that the experimentation required to do so is undue.

4. The Application as originally filed was sufficient at the time of filing to enable a practitioner of ordinary skill in the art to produce a wide variety of exogenous proteins in the oviduct of germline transgenic avians on a routine basis. In fact, the methods disclosed in the Application have proven to be robust and reliable enabling us to successfully make germline transgenic birds which lay eggs containing a number of proteins specifically named in the Application (for example, at page 31 of the Application) including: β-lactamase, granulocyte colony stimulating factor (G-CSF), erythropoietin (EPO) and interferon, i.e., interferon alpha 2 (IFNα2). Furthermore, by following the disclosure of the Application, a practitioner of ordinary skill in the art would be able to make lines of germline transgenic avians that lay eggs containing many different proteins in addition to those proteins that have been produced thus far and in addition to those proteins disclosed in the Application.

5. Germline transgenic chickens that produce beta lactamase (BL) in their oviduct were made in accordance with the Application. The data for the production of BL germline transgenic birds is as follows:

Production of G0 chimeric germline transgenic NLB-CMV-BL chickens was described in Examples 1 to 3 of the Application. G1 germline transgenic birds that produce BL in the oviduct were produced from the chimeric germline transgenic G0 male bird having the highest level of transgene in the sperm using standard breeding methodologies apparent to practitioners of ordinary skill in the art, i.e., the G0 roosters containing transgene in their sperm were crossed with non-transgenic chickens. Out of a total of 1026 G1 offspring tested by PCR analysis of genomic DNA, one rooster and two hens tested positive for the NLB-CMV-BL transgene. Eggs laid by the G1 germline transgenic females and their descendents contained between about 0.5 μg/ml and about 1.6 μg/ml of

BL, as determined by ELISA.

6. The methods used for making germline transgenic avians that produce G-CSF, EPO and interferon are disclosed in the Application. That is, the NLB-CMV-BL vector of Example 1 in the Application was altered to replace the BL coding sequence of the vector with the coding sequences for G-CSF, EPO and IFNα2. Germline transgenic birds were obtained using these modified NLB-CMV vectors in accordance with methods disclosed in the Application. These results are discussed in the following paragraphs.

7. Germline transgenic chickens that produce IFNα2 in their oviduct were made in accordance with the Application. The IFNα2 coding sequence was optimized for chicken codon usage, though such codon modification is not required to obtain useful yield of exogenous protein from the egg white as can be seen in the production of other proteins described herein. The description for the production of IFNα2 germline transgenic chickens is as follows:

The BL coding sequence of NLB-CMV-BL was replaced with the IFNα2 coding sequence optimized for chicken codon usage, producing NLB-CMV-IFNα2. NLB-CMV-IFNα2 transduction particles were produced essentially as described in Example 2 of the Application. 300 White Leghorn chicken eggs were windowed and injected with the transduction particles essentially as described in Example 3 of the Application. Three chimeric germline transgenic G0 roosters with the highest NLB-CMV-IFNα2 transgene level in their sperm were bred to non-transgenic females by artificial insemination to produce G1 birds. The 1,597th G1 offspring tested by PCR analysis of genomic DNA was a germline transgenic male carrying the NLB-CMV-IFNα2 transgene. The male G1 offspring was bred to non-transgenic female chickens by artificial insemination to produce G2 offspring. Egg white from eggs laid by G2 germline transgenic females and their descendents contained on average about 2.7 μg/ml of IFNα2, as determined by ELISA. Purified IFNα2 obtained from eggs of the G2 birds and their descendents has entered clinical trials for FDA regulatory approval. Purification of exogenous proteins such as IFNα2 from eggs laid by transgenic birds can readily be accomplished by a practitioner of ordinary skill in the art using standard protein purification methodologies.

8. Germline transgenic chickens that produce G-CSF in their oviduct were made in accordance with the Application. The G-CSF coding sequence used was the human G-CSF nucleotide coding sequence. The description for the production of G-CSF germline transgenic chickens is as follows:

The IFNα2 coding sequence of NLB-CMV-IFNα2 was replaced with the human G-CSF coding sequence producing NLB-CMV-G-CSF. NLB-CMV-G-CSF transduction particles were produced essentially as described in Example 2 of the Application. 274 White Leghorn chicken eggs were windowed and injected with the transduction particles essentially as described in Example 3 of the Application. 41 of the eggs hatched. Two chimeric germline transgenic G0 roosters positive for the NLB-CMV-G-CSF transgene were bred to non-transgenic females by artificial insemination producing 4353 offspring, 14 of which were identified as germline transgenic G1's carrying the NLB-CMV-G-CSF transgene. Egg white of eggs laid by the G1 germline transgenic females and their descendents contained an average of about 3 μg/ml of G-CSF, as determined by ELISA. Purified G-CSF obtained from eggs of these G1 birds and their descendents has entered clinical trials for FDA regulatory approval. Purification of exogenous proteins such as G-CSF from eggs laid by transgenic birds can readily be accomplished by a practitioner of ordinary skill in the art using standard protein purification methodologies.

9. Germline transgenic chickens that produce EPO in their oviduct were made in accordance with the Application. The EPO coding sequence used was the human EPO nucleotide coding sequence. The description for the production of EPO germline transgenic chickens is as follows:

The IFNα2 coding sequence of NLB-CMV-IFNα2 was replaced with the human EPO coding sequence producing NLB-CMV-EPO. NLB-CMV-EPO transduction particles were produced essentially as described in Example 2 of the Application. 1234 White Leghorn chicken eggs were windowed and injected with the transduction particles essentially as described in Example 3 of the Application. 334 of the eggs hatched. Seven of the hatched G0 roosters tested positive for the NLB-CMV-EPO transgene.

Three chimeric germline transgenic roosters that tested positive for the NLB-CMV-EPO transgene were bred to non-transgenic females by artificial insemination to produce 1190 offspring, 14 of which were transgene positive germline transgenic G1's. Egg white of eggs laid by the G1 germline transgenic females or their descendents contained about 0.4 to 1.9 μg/ml of EPO, as determined by ELISA. Purification of exogenous proteins such as EPO from eggs laid by transgenic birds can readily be accomplished by a practitioner of ordinary skill in the art using standard protein purification methodologies and, in fact, transgenic chicken derived EPO has been purified from eggs for use in *in vivo* and *in vitro* erythropoietin activity studies.

10. From the proceeding paragraphs it can be seen that production of transgenic birds that produce exogenous proteins in the oviduct is predictable and routine when following the teachings of the Application. As is expected a number of transgenic birds typically need to be screened in order to identify the transgenic G1 offspring (first generation of fully transgenic germline birds) obtained from the germline chimeras. However, such screening and identification can be accomplished routinely and with predictability by skilled technicians in the field of poultry science and molecular biology. In addition, identifying lines of G1 birds which lay eggs containing useful quantities of the transgene encoded exogenous protein has been predictable and routine using vectors of the invention. For example, use of the non-tissue specific CMV promoter to express the exogenous protein in the avian oviduct has been routine and has not required undue experimentation. In addition, random integration of the NLB vector into the avian genome has not made practicing the invention unpredictable and has not imposed undue experimentation in order to practice the invention.

11. Approximately 50% of offspring produced by crossing non-transgenic birds with the G1 germline transgenic avians produced in accordance with the Application (and having a confirmed single transgene copy in their genome) were transgene positive. This inheritance pattern is what is expected based upon Mendelian inheritance, thus providing further confirmation of germline transmission originating from the germline chimeric birds. Furthermore, approximately half of all subsequent

offspring (G3, G4, G5, ect) obtained from the germline transgenic avian lines produced in accordance with the Application have been fully germline transgenic, as would be expected in stable germline transmission of a hemizygous allele.

12. In addition to the production of germline transgenic chickens, I believe that the vectors and methods described in the Application can be used to produce germline transgenic avians other than chickens. In particular, the infectivity of ALV is not limited to chickens. In support of this, provided below is data showing production of transgenic quails that were produced using the NLB-CMV-G-CSF retroviral vector of paragraph 8 above and methods described in the Application.

13. Fertilized quail eggs were windowed and injected with NLB-CMV-G-CSF transduction particles essentially as described in Example 3 of the Application and approximately 24% of the hatched G0 hens were positive for the NLB-CMV-G-CSF transgene. Eggs of the G0 transgenic quail hens contained between about 25 pg and about 160 pg of G-CSF as determined by ELISA of the egg white from eggs laid by the birds. A low yield of exogenous protein in the egg white is not unexpected in eggs of G0 avians since the birds will be chimeric for the transgene (i.e., only a small percentage of the cells in the G0 birds will be transgene positive).

14. The reason for producing these transgenic quail was for purposes related specifically to quantification of promoter activity, which can be accomplished in G0 chimeric birds. The reason to use quail for this purpose is the rapid maturation rate (time from hatch to egg laying) of quail compared to chickens, 6 weeks for quail opposed to 20-22 weeks for chickens. The transgenic quail were not made with the goal of producing a germline transgenic flock to produce exogenous proteins because the volume of egg white contained in a quail egg is quite small compared to that of a chicken. Therefore, the laborious task of screening for germline transgenic quail was not undertaken. However, I believe with a high level of certainty that G1 germline transgenic quail which produce exogenous protein in the oviduct could be obtained from the transgenic G0 quails that were produced. In addition, I believe germline transgenic

avians other than chicken and quail which produce exogenous protein in the oviduct can be produced in accordance with the invention as disclosed in the Application.

15. I hereby further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the Application or any patent issuing thereon.

Signed Robert D. Ivarie

Robert D. Ivarie, Ph.D.

Dated 8/10/07

IVARIE CURRICULUM VITAE

NAME: Robert Ivarie

ADDRESS: Department of Genetics
Life Sciences Building
University of Georgia
Athens, Georgia 30602-7223

EDUCATION

Ph.D., September, 1972, University of Colorado, Department of Molecular, Cellular & Developmental Biology, Boulder, Colorado, in Biology
A.B., June, 1967, Stanford University, Stanford, California, in Biological Sciences with Honors and Distinction.

PROFESSIONAL AND RESEARCH EXPERIENCE

7/04 to present	Head, Department of Genetics, University of Georgia, Athens
11-96 to present	Adjunct Professor of Animal and Dairy Science, University of Georgia, Athens
7-96 to present	Chief Scientific Officer (through 1999), Chairman of the Scientific Advisory Board, & Scientific Co-founder, *ex officio* member, Board of Directors, AviGenics, inc., Athens, Georgia
9-93 to present	Professor, Department of Genetics, University of Georgia, Athens
9-86 to 8-93	Associate Professor, Department of Genetics, University of Georgia, Athens
3-80 to 8-86	Assistant Professor, Department of Genetics, University of Georgia, Athens
9-77 to 2-80	Adjunct Assistant Professor, Endocrine Res. Div, Metabolic Research Unit, Dept of Medicine, University of California, San Francisco
1-77 to 9-77	Postgraduate Res, Assoc., Metabolic Res. Unit, Univ. of Calif., San Francisco; **Sponsor**: John D. Baxter **Subject of research:** Two-dimensional analysis of thyroid and steroid hormone responses in rat pituitary tumor cells; characterization of pituitary cell lines defective in *prolactin* gene expression.
9-72 to 1-77	Postdoctoral Fellow, Department of Biochemistry and Biophysics, University of California, San Francisco, Lecturer, Biochemistry 1976 **Sponsor**: Gordon M. Tomkins **Subject of research**: Steroid-mediated regulation of enzymes and specific proteins in rat hepatoma cells.
9-67 to 9-72	Graduate Student, University of Colorado, Department of Molecular, Cellular and Developmental Biology, Boulder, CO . **Sponsor**: Jacques J. Pene **Subject of research:** Association of bacterial and viral deoxyribo-nucleic acid with the cell membrane.
9-66 to 9-67	Undergraduate Student, Stanford University, Department of Biological Sciences, Stanford, CA **Sponsor**, Norman K. Wessells **Subject of research:** Developmental aspects of the cell cycle of the unicellular alga, *Acetabularia*.

PAST FUNDING

"Mutations Affecting Gene Expression in Tumor Cells," National Science Foundation, $50,928, 9/77-3/80.

"Mutations Affecting Gene Expression in Tumor Cells," National Cancer Institute, $147,000, 5/78-5/82.

"Induction of DNA Methylation in vivo by Chemical Carcinogens," University of Georgia Faculty Research Grant, $4,600, 7/82-6/83.

"Purification of a Plant DNA Methylase," University of Georgia Faculty Research Grant, $4,000, 2/84-1/85.

Multiuser Instrumentation Grant for DNA Synthesizer and Protein Sequenator, National Science Foundation, $134,000 (Co-PI with six UGA faculty; R. Meagher, PI).

Biomedical Research Support Grant Program: NIH, $7,000, 1/87-6/87.

Biological Sequence Computation Facility, NSF Instrumentation grant, $190,000 for computer equipment with $200,000 matching funds from The University of Georgia Research Foundation (Co-PI with 10 faculty; J. Arnold and R. Meagher, PI's).

"Inactivation of Gene Expression by DNA Alkylating Agents," NCI, $468,000 (TDC), 7/83-6/91.

"Embryonic Expression of myogenic factor genes in muscles of genetically large and small Japanese quail, University of Georgia Research Foundation, Inc. Biotechnology Program, $72,000, 7/91-6/93.

"Molecular Structure and Function of Bovine *Myf-5*" Eli Lilly Company, $544,000 (TDC), 11/88 to 6-93.

"Cellular and molecular determinants of differential muscle growth and differentiation in Japanese quail lines divergently selected for body weight," University of Georgia Research Foundation, $86,500 (TDC when fringe benefits included), 7/95-6/97.

"Promoter-Less Minigene Insertion Technology in Avian Transgenesis," Faculty Research Commercialization Program, Advanced Technology Development Center of the State of Georgia, $50,000, 7/96-6-97.

"Modification of the avian genome via homologous recombination, University of Georgia Research Foundation Biotechnology Program, $73,000, 7/96-6/98.

Equipment Grant, Georgia Research Alliance, $250,000, 1998. Technology Development Program of the Georgia Research Alliance, Phases I-III, $150,000, 7/96- 6/99.

Applied Genetic Technology Resource (AGTEC), University of Georgia, 1997-99, Avian Transgenesis Resource, Georgia Research Alliance: (1) $175,000, renovation, 4th floor of the new Animal Science Building, (2) $1,1253,000, facilities planning funds, (3) $1,015,000 equipment funds; and (4) $8,000,000 for research buildings. (Funds in support of plant and animal transgenic groups overseen by a 7 member executive committee of which I am a member).

Applied Genetic Technology Resource (AGTEC), University of Georgia, 1997-00, Georgia Research Alliance, $1,500,000 Avian Transgenic Facility.

"Rational design of ribozymes for gene inactivation based on intracellular targeting," University of Georgia Research Foundation Biotechnology Award, $72,562, Co-PI with Michael Terns, 7/99-6/01.

"Modification of the avian genome via transgenesis," AviGenics, Inc. $1.35M , 4/96-6/03.

"Genes for Georgia," National Science Foundation, Partnerships for Innovation program, PI Karen Holbrook, CoPIs myself and Andy Paterson, $600,000, 3/15/02-3/14/05

PROFESSIONAL SOCIETIES

American Association for the Advancement of Science

ACADEMIC HONORS

Undergraduate:	University Scholarship (9/62-6/63) Nathaniel Green Guiberson, Jr. Scholarship (9/65-9/66) Mary Yost Honors Scholarship (9/66-9/67) Graduated with Distinction and with Honors in Biology (1967)
Postgraduate:	Graduate National Science Foundation Trainee (9/67-9/68) National Science Education Act Fellow (9/68-9/71) Leukemia Society of America, Postdoctoral Fellow (9/72-8/74) National Institute of Health, Postdoctoral Fellow (6/75-5/76)
Faculty:	Best Cover, *Biotechniques* 1992 Fellow, American Association for the Advancement of Science (2005-) University of Georgia Inventor's Award, 2007

SERVICE TO GRANTING AGENCIES/CONSULTATION/ORGANIZING SYMPOSIA

Study Section member, Oklahoma Center for the Advancement of Scientific Technology, Equipment Allocation Panel (1989)

Chair, Molecular Genetics Panel, Health Science Research Grants, Oklahoma Center for the Advancement of Science (1991-96)

Ad hoc member of the Molecular Biology (1991) and Developmental Biology (1994) Panels, American Cancer Society

Ad hoc reviewer of multiple grants to the National Science Foundation (Genetic Biology, Cellular and Physiology Panels), and to the March of Dimes Research Foundation

University of Georgia Research Foundation Biotechnology Grants Program (1988-89)

Consultant, Animal Sciences Division, Eli Lilly & Company(1987-93)

External Advisory Committee on Program Project grant, "Toxic Probes of Neuro-degenerative Disease," Center for Environmental and Occupational Toxicology, University of Oregon Health Sciences Center (1990-92)

Co-organizer with Larry Shimkets, Regional Conference of the Southeastern Society for Developmental Biology Conference (1993)

Director, Cell & Developmental Faculty Program, University of Georgia (1993-2000)

Ad hoc Review Committee for Program Projects, member, "Mechanisms of muscle aging: analysis and intervention," reverse site visit, National Institute on Aging, NIH (1995)

Ad hoc reviewer, Academic Research Initiation Grants Program, North Carolina Biotechnology Center (1997-99)

Chairman, Scientific Advisory Board of Avigenics, inc. (1996-present)

Member, Board of Directors, AviGenics, inc. (1996-98)

Ex officio Member, Board of Directors, AviGenics, inc. (1999-02)

Advisory Committee member, Applied Genetic Technology Resource (AGTEC), UGA (1997-2000)

Director, Avian Transgenesis Resource, University of Georgia (1997-2000)

Ad hoc reviewer, USDA, Growth and Differentiation panel, (1997-present)

Ad hoc reviewer, USDA National Research Initiative, Molecular Genetics, (1997-present)

Tertiary reviewer, Oklahoma Ctr. for the Advancement of Scientific Technol., (1999-00)

Member, Health Research and Applied Research panels, Oklahoma Ctr. for the Advancement of Scientific Technol., (2000 –2007))

Ad hoc reviewer, Science Council of British Columbia, Technology BC program (2000-present)

Chair, Avian Transgenesis, Int. Symposium on Transgenics in Agriculture, Beijing (2000)

Growth and Nutrition Panel Member, National Research Inititive, USDA (2001)

Organizer, Avian Transgenesis, Atlanta GA, funded by a $5,000 grant from the USDA.

EDITORIAL SERVICE

Associate Editor, *Analytical Biochemistry* (7/1/89-2/28/96)
Executive Editor, *Analytical Biochemistry* (3/1/96 to present)
***Ad hoc* Reviewer** for journals and textbooks:

Journals

Analytical Biochemistry
Animal Genetics
BCM Evolutionary Biology
Biotechnology Laboratory
Cancer Research
Cell
J. Biological Chemistry
J. Molecular Evolution
J. Molecular Biology
Molecular & Cellular Biology
Nature Genetics
Nature Biotechnology

Developmental Dynamics
J. Cell Biology
Gene
Genes and Development
Growth, Dev. & Aging
J. Animal Science
Nucleic Acids Research
Plant Cell
Plant Physiology
Poultry Science
Proc. National Academy of Sciences
Transgenic Research

Textbooks
Davis & Weller's *Gist of Genetics*
Reid's *Creative Thinking Exercises for Genetics*
Shotwell's *Genetics, Science & Technology*
Snustad *et al.*'s *Principles of Genetics*
Suzuki et al.'s *Introduction to Genetic Analysis*
Klug & Cummings *Concepts of Genetics*
Griffith's *et alia's Modern Genetic Analysis*
Hartwell *et alia's Genetics: From Genes to Genomes*
Brooker's *Genetics: Applications and Principles*
Young's *Analytical Genomics*
Russell's *iGenetics (2nd ed.)*
Hartwell *et alia's Genetics: From Genes to Genomes (2nd ed.)*

SYMPOSIA PRESENTATIONS

1970 Annual Meeting of the American Society of Microbiology (short talk).
1974 Gene Regulation in Mammals, The Jackson Laboratory, Bar Harbor, Maine (talk).
1976 Electrofocusing and Isotachophoresis Conference, Hamburg, Germany (talk).
1979 ICN-UCLA Symposium, Eukaryotic Gene Regulation, Keystone, Colorado (poster).
1980 Atlanta Genetics Society, University of Georgia, Athens, Georgia. (poster).
1981 First International Congress on Recombinant DNA, San Francisco, California (poster).
1982 Endocrine Society Meeting, GH3 Cell Subgroup, San Francisco, California (talk).
1983 FASEB Summer Research Conference, Somatic Cell Genetics, Saxton's River, Vermont (talk).
1984 FASEB Summer Research Conference, Somatic Cell Genetics, Saxton's River, Vermont (2 posters).
6th Annual West Coast Chromosomes and Chromatin Meeting, Asilomar, California (talk).
1985 "GH Pituitary Cell Strains as Tools in Molecular and Cellular Biology," NATO International Workshop, Chantille, France (talk; session chair).
1986 Annual meeting of Genetics Society, San Francisco, California (2 posters). "Molecular Biology of the Nucleus," Pennsylvania State University Symposium, State College, Pennsylvania (poster).
1987 Annual meeting of the Genetics Society, San Francisco, California (poster).
1988 Annual conference of the American Meat Science Association, University of Wyoming, Laramie (plenary session talk).
British Cell Biology Society symposium on "Differentiation: New Perspectives, "Oxford University, England (poster).
International Genetics Conference, Ontario, Canada (poster).
1989 UCLA Symposium on "Nucleic Acid Methylation," Frisco, Colorado (talk, poster).
Cell Biology meeting, San Francisco, California (poster).
CIBA Foundation workshop on DNA methylation, London, England (talk).
1990 UCLA Symposium on "Growth Factors and Differentiation", Steamboat Springs, Colorado (poster).
Second New England BioLabs Workshop on Biological DNA Modification, Berlin, Germany (talk, poster).
FASEB summer symposium on Gene Regulation, Copper Mountain, Colorado (poster).
FASEB summer symposium on Genetics and Molecular Biology, Copper Mountain, Colorado (poster).
1991 UCLA Symposium on "Neuromuscular Development," Keystone, Colorado (poster).

1992 American Society of Animal Science Biennial Growth Symposium, Pittsburgh, Pennsylvania (plenary talk).
UCLA Symposium on "Growth and Differentiation Factors in Vertebrate Development," Keystone, Colorado (poster).
Jacques Monod Conference on "Early Steps in Development," Aussois, France (talk).
Gordon Research Conference on "Myogenesis," Tilton, NH (two posters).
1993 Southeastern Regional Developmental Biology Conference, University of Georgia (talk, two posters)
1994 UCLA Keystone Symposium, "Muscle Development", Snowbird, Utah (two posters)
1997 Animal Science Conference, "Transgenic Animals in Agriculture", Athens, Georgia (session talk)
1998 Plant & Animal Genomes Conference, San Diego, CA (poster)
UCLA Symposium on Vertebrate Development, Steamboat Springs, CO (poster)
Genetically Engineering & Cloning Animals: Science, Society & Industry Symposium, Park City/Deer Valley, UT (poster)
1999 Plant & Animal Genomes Conference, Poultry Genome Workshop, San Diego CA (talk)
Agricultural Genomics: New Technologies, Functions & Advances, Chairman of Transgenics Track, San Diego, CA (talk with Mike McDonell)
Transgenic Animal Research Conference, Tahoe City, CA (talk)
Protein Production Conference, Washington DC (poster)
2000 Joint Meeting of the American Dairy Science Association and the American Society of Animal Science, Baltimore MD (talk, with Dr. Mike McDonell)
International Conference on Transgenesis in Agriculture, Beijing, PRC (Chair, Avian Transgenesis, session talk)
2001 Transgenic Animals in Agriculture, Tahoe City, CA (poster)
2002 Sigma Xi Society, Guest Speaker, Athens, GA
Poultry Science Association Ancillary Meeting on Biotechnology (session talk, with Glenn Monastersky)
Keynote speaker (one of two), Dedication of the Animal Biotechnology Building, University of Maryland and USDA.
2003 Plant and Animal Genome Conference, San Diego,CA (poster)
Poultry Workshop, Plant and Anmal Genome Conference, San Diego, CA (session talk with Thomas Wicker).
2004 Plant and Animal Genome Conference, Poultry Workshop, San Diego, CA (session talk)
2005 Plant and Animal Genome Conference, Reduced-Representation Workshop, San Diego, CA (session talk).
2006 Next Generation of Protein Therapeutics, Basel, Switzerland (session talk).

RESEARCH SEMINARS (since postdoctoral)

1976 Department of Pharmacology, State University of New York, Stony Brook, New York.
Imperial Cancer Research Fund, Lincoln's Inn Fields, London.
Basel Institute for Immunology, Basel, Switzerland.
University of Geneva Medical School, Geneva, Switzerland.
1977 Department of Biochemistry and Biophysics, University of California, San Francisco, CA
Metabolic Research Unit, School of Medicine, University of California, San Francisco, CA
Biology Department, University of Indiana, Bloomington, Indiana.
Department of Endocrinology, School of Medicine, University of Texas, Dallas, Texas.
1978 Division of Biological Sciences, University of Missouri, Columbia, Missouri.
1979 Department of Biochemistry, Brandeis University, Waltham, Massachusetts.
Department of Biochemistry, University of Georgia, Athens, Georgia.
Department of Biochemistry, University of Missouri, Columbia, Missouri.
Medical Research Center, Prince Henry's Hospital, Melbourne, Australia.
1982 Department of Molecular & Population Genetics, University of Georgia, Athens, Georgia
Medical Research Center, Prince Henry's Hospital, Melbourne, Australia.

	Walter and Eliza Hall Institute, Royal Melbourne Hospital, Melbourne, Australia.
	Department of Genetics, North Carolina State University, Raleigh, North Carolina.
1983	Molecular Genetics Section, Pfizer Corporation, Groton, Connecticut.
	Department of Biology, Emory University, Atlanta, Georgia.
	Endocrinology & Metabolic Disease Section, Medical College of Georgia, Augusta, Georgia.
	Department of Endocrinology, Medical College of Georgia, Augusta, Georgia.
1984	Department of Cell Biology, Upjohn Company, Kalamazoo, Michigan.
	Department of Biochemistry & Biophysics, University of California, San Francisco, California.
	Metabolic Research Unit, Division of Endocrinology, Department of Medicine, University of California, San Francisco, California.
1985	Division of Cancer Research, Upjohn Company, Kalamazoo, Michigan.
	CSIRO Division of Molecular Biology, Sydney, Australia.
	Department of Genetics, Australia National University, Canberra City.
	The Cancer Institute, Peter MacCallum Hospital, Melbourne, Australia.
	Medical Research Center, Prince Henry's Hospital, Melbourne, Australia.
	Department of Genetics and Human Variation, La Trobe University, Bundoora, Australia.
	Genetics Department Retreat, University of Georgia, Sapelo Island, Georgia.
	Biotechnology Seminar Series, School of Agriculture, University of Georgia, Athens, Georgia.
1986	Department of Pharmacy, Rutgers Medical School, Rutgers University.
1987	Division of Animal Science, Eli Lilly & Co., Greenfield Labs, Greenfield, Indiana.
	Department of Genetics, University of Georgia, Athens, Georgia.
	Metabolic Research Unit, Department of Medicine, University of California, San Francisco,California.
	Cetus Corporation, Emeryville, California.
1988	Genetics Department Retreat, University of Georgia, Unicoi, Georgia.
	Animal Science Division, Greenfield Labs, Eli Lilly & Company, Greenfield, Indiana.
1989	Department of Biological Chemistry, University of Illinois, Chicago, Illinois.
	Department of Endocrinology, University of Colorado Health Science Center, Denver, Colorado.
	Centre for Molecular Biology and Biotechnology, University of Queensland, St. Lucia, Queensland, Australia.
	Lilly Research Labs, Animal Science Division, Greenfield, Indiana.
1990	Department of Physiology and Pharmacology, School of Veterinary Medicine, University of Georgia, Athens, Georgia.
	Agricultural Education Department, University of Georgia, Athens, Georgia.
	Department of Biochemistry and Molecular Biology, University of Oklahoma Health Science Center, Oklahoma City, Oklahoma.
	Lilly Research Labs, Animal Science Division, Greenfield, Indiana.
1991	Baker Institute for Medical Research, Melbourne, Australia.
	Walter and Eliza Hall Institute for Medical Research, Melbourne, Australia.
1992	Genetics Department, University of Georgia, Athens, Georgia.
	Poultry Science Department, University of Georgia, Athens, Georgia.
	Department of Pharmacology, University of Georgia, Athens, Georgia.
1993	Lilly Research Lab, Animal Science Division, Greenfield, Indiana
1994	Genetics Department, Athens, Georgia
	Institute of Child Nutrition & Development, Baylor University, Houston, Texas
1995	Arbor Acres Farm, Hartford, Connecticut
	Goldkist Corporation, Atlanta, Georgia
1996	Crystal Farms, inc. Gainesville, Georgia
	J & S Farms, Gainesville, Georgia
	Technology Venture Alliance, inc., Atlanta, Georgia
	Asset Management, inc., Menlo Park, California
1997	Roche Vitamins and Fine Chemicals Division, Basel, Switzerland
	S.E. Animal Care Society's symposium on transgenic animals, Athens, GA.
	Recombination Biocatalysis, Inc., San Diego, CA.
	Department of Pharmacy, University of Georgia, Athens, GA

	Schering-Plough, Inc. Biotechnology Group, Newark, NJ
	MetaMorphix, Inc., Molecular Biology Division, Baltimore, MD
	Noro-Moseley Partners, Atlanta, GA
1998	Department of Genetics, University of Georgia, Athens
	Cordova Capital, Atlanta
	Department of Animal and Dairy Science, University of Georgia, Athens
	Oakwood Laboratory, Cleveland
	Department of Animal Science & Technology, Seoul National University, Suweon, South Korea
1999	Department of Poultry Diagnostic & Research Center, University of Georgia, Athens
	Michigan State University, Department of Microbiology & the Avian Disease and Oncology Lab, USDA, East Lansing.
	Department of Poultry Science, University of Georgia, Athens
2000	Department of Animal Science & Technology, Seoul National University, Suweon, S. Korea
	Life Sciences Division, Mitsubishi Corporation, Tokyo, Japan
2002	Clark Atlanta University, Department of Biology, Atlanta, GA
2004	Genetics Department Retreat, University of Georgia, Athens

PUBLICATIONS (peer-reviewed)

1. **Ivarie, R.D.**, and Pene, J.J. (1970). Association of the *Bacillus subtilis* chromosome with the cell membrane: Resolution of free and bound deoxyribonucleic acid on Renografin gradients. *J. Bacteriol.* 104, 839-850.

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